



Int J Ayu Pharm Chem
www.ijapc.com
e ISSN - 2350-0204
Volume 8 Issue 3
5/10/2018

Greentree Group Publishers





A Comprehensive Study of Anatomy and Physiology of Urinary System in Ayurveda

Bishnu Kumar^{1*} and Jyoti Singh²

¹GS Ayurvedic Medical College, Ghaziabad, UP, India

²Assistant Professor, Dept. of Pharmacology, Ashoka Institute of Technology and Management, Varanasi, UP, India

ABSTRACT

The descriptions of anatomy, physiology in Samhitas does not resemble much to the certain aspects of the present knowledge of urinary system. The organ 'Vrikka' has been mentioned as organ of the 'Koshtha'. Its position, shape, number resembles kidneys but its vital role in formation of urine is not clearly mentioned in Brihatrayi. The functions attributed to Vrikka do not clearly match with the present knowledge of physiology of kidneys. All the references from the Samhita are suggestive that formation of urine is linked with Antra (intestine) and Basti (urinary bladder). The food we consume is divided into Sara (essence of food) and Kittabhaga (waste portion) in the GI tract during process of digestion. Again the waste product gets divided into solid and liquid parts. From the liquid portion Sweda and Mutra are formed. Mutravaha Nadi originating from Pakwashaya (large intestine) by thousands of very minute openings, which are not visible due to their minuteness, is situated in between Pakwashaya and Mutrashaya. These Nadi carry on the function of Mutra-Nisyandana continuously. If we analyze this concept, it looks to be mere observation of ancient physician. When a person consumes more liquid immediately output increases where as if person restricts oral fluids then output get reduces. Concept of urine formation was a mere observation on the basis of its direct relation to urine volume with water intake. It can also be concluded that, role of kidney in urine formation is not clear in Brihatrayi. The Apana Vayu is responsible for the regulation of urinary system. When Apana Vayu gets vitiated it results in various Mutra Rogas. Our ancient scholars have described various Mutra Rogas like Mutraghata, Mutrakrichchra etc. These can be correlated with different bladder dysfunction. This article reviews the various concept of Urological terms in Ayurveda regarding its classification, symptomatology, etiological factors, pathology, complications and management have been dealt with both medico-surgical procedure. It is an attempt to compile



Greentree Group

Received 03/04/18 Accepted 20/04/18 Published 10/05/18

the various concept of urological anatomy and physiology scattered in Ayurveda and correlated them with modern urinary system.

KEYWORDS

Charak, Sushruta, Astanga Hridaya, Astanga Sanghra, Commentators



Greentree Group

Received 03/04/18 Accepted 20/04/18 Published 10/05/18



INTRODUCTION

Basti is one of the three vital organs in the body, the other two being *Hridaya* and *Nabhi*. It is the most important organ maintaining the homoeostasis by regulating the excretion of the metabolites and waste products, i.e., *Dosha*, *Dhatu* and *Mala*. *Vegavarodha*, i.e., suppression of natural urges is an important cause of various diseases. Ayurveda states that suppression of micturition is one of the most important causes of the disease of urinary tract. With progressive urbanization and inadequate toilet facilities, this cause has assumed greater importance. According to *Ayurveda* body physiology is maintained by *Tridosha* Theory i.e. *Vata*, *Pitta* and *Kapha*. Likewise the functions of *Mutravahasrotas* (urinary system) is also regulated by *Apanavayu* one among the five types of *Vayu*. Obviously any derangement of *Apana Vayu* leads to the pathology of the urinary system. So, the treatment principle is to correct the vitiated *Apana Vayu*, thereby attaining the normal physiology of the urinary system. This controls the symptoms of the *Mutravaha Shrotas* (urinary system). It is an attempt, to make a deep effort to acquaint the reader with the wealth of knowledge available in Ayurvedic literature on the important subject of *Anatomy and*

physiology of urinary system in Ayurveda.

The literal meaning of the texts has been adhered to as far as possible and the basic concepts are presented in the original form. The relevant Sanskrit stanzas together with references are also given. After interpretation of above discussion, it is an attempt to assemble the scattered *Anatomical terms and physiology of urinary system in ayurveda* and correlate them with modern urological terms. One can easily appreciate the wisdom of Ayurvedic physicians who have meticulously described the various concept of urology in Ayurveda.

AIMS AND OBJECTIVES

1. To provide details about the Anatomy and physiology of urinary system .
2. To explain the anatomical terms of ayurveda.
3. To correlate anatomical terms of ayurveda with modern.

MATERIALS AND METHODS

1. References of *anatomy and physiology* have been collected from the classical books of Ayurveda.
2. All the data was assemble, analyzed and discussed in depth about Anatomy and Physiology of urinary system , from books and other authentic sources.



3. Ayurvedic and modern approach in *Urological Anatomy and Physiology* have also been compiled in this review.

ANATOMY OF URINARY SYSTEM IN AYURVEDA

The concept of urinary system is mentioned in *Atharveda*. The detailed anatomy of urinary system is not described in *Atharveda* but earliest description of urinary retention, its surgical management by probing urethra and direct puncturing of urinary bladder (cystotomy) with *Shara* (arrow) is available in *Atharveda*¹.

Reference regarding obstruction to passage of urine is available in *Uttarkanda* of *Valmiki Ramayana* (before 2000B.C.). In *Ayurvedic Samhitas*, a detail description of urinary system is available but it is present in scattered form. Description of various organs is found in relation to anatomy of urinary system in *Ayurvedic* texts. These are: *Vrikka*, *Gavini*, *Basti*, *Mutrapraseka*, *Mutravaha srotas*, *Mutravaha nadis*, *Mutravaha sira*, *Mutravaha dhamanis*.

VRIKKA

Anatomical Position²

Charaka described *Vrikka* among 15 *Kosthangas*. These are two in numbers situated in rights and left *Kukshi*.

In reference to *Abhyantar vidradhi*, *Susruta* describe the site of *abhyantar vidradhi*, in that he described *vrikka* as a organ. In the same reference, *Achrya*

Dalhana described *Vrikkas* as a two rounded muscular organs situated in *Kukshi* one in *Vamaparshwa* (left lumber region) and another one in *Dakshinaparshwa* (in right lumber region).

Embryological Development³ According to *Sushruta* development of *Vrikka* occurs from *Prasadbhaga* of *Rakta* and *Meda*. *Charaka* has counted *Vrikka* under *Matraja Bhava* .

ROOT OF ORIGIN OF VRIKKA⁴

Sushruta, *Charaka* and *Vagbhata* mentioned *Vrikka* in relation to *Mutravaha Srotas*. According to *Charaka* and *Sushruta* both they have considered root of *vrikka* (**kidney**) is *Medovaha Srotasa*. *Vagbhata* followed *Charaka* in this regard. *Vagbhata* shows some existence between *Vrikka* and formation of urine, while describing the *Aashaya* and their related *Kosthtangas*. On review of *brihatraye* literature, it is clear that location, number and external appearance of *Vrikka* exactly matches with kidney.

GAVINI⁵

The reference of *Gavini* is not available in *Brihatraye* texts but in *Atharveda*, *Gavini* are mentioned in relation with *Basti* and *Antra*. These are paired organs and transport urine from *Antra* to *Basti*. On the basis of function *Gavinis* can be correlated with ureters. *Sayanacharya* commenting on this reference says that *Mutra* originates



from *Antra*, transverse through *Gavini* to reach *Basti*. Description of *Gavini* is available in *Veda* but in *Ayurvedic* texts, description of paired structure joining kidney and bladder is missing. *Basti* was used as a medium for giving medicated enema and for this purpose, it was isolated from the bodies of animals. Without cutting these paired structures, it is not possible to take out *Basti* from the body. *Sushruta* has described that *Basti Yantra* is prepared by joining tube to one end and cauterizing the two openings. These openings can be related with openings of ureter. It is practically impossible that *Acharya Sushruta* had not noticed similar structures in the humans. Either the description of ureter might be lost with the passage of time or they had not described it intentionally as functions of these structures were not known to them and so they have not given due importance to them.

BASTI⁶

The depiction about the organ *Basti* is available elaborately in *Ayurvedic* texts. *Basti* is one of the *Trimarma* and it also come under *Sadhya-pranahar Marma*

Synonyms *Mutrashaya, Mutradhara, Mutrabasti, Maladhara, Bastiputaka.*

Embryological Development

Charaka has counted *Basti* under *Matraja Bhava*. In *Sushruta Samhita* description of

development of *Basti* is available in *Sharira Sthana*.

Anatomical Position

According to *Charaka, Sushruta* and *Vagbhata, Basti* is situated in *Kosth*. According to *Charaka* position of *Basti* is between *Sthula Guda, Mushka, Sevani, Shukravaha and Mutravaha Nadis*. According to *Sushruta, Basti* is situated in *Gudasthi Vivara* and is surrounded with different structures. These are *Nabhi, Prishtha, Kati, Mushka, Guda, Vankshana, Shepha*. The other related structure are in the pelvic cavity are: *Bastishira, Paurusha, Vrishana* and *Guda*.

Anatomical relations of Basti according to Sushruta

According to Sushruta Basti is Alabu shaped.

Alabu iva roopa basti akara

Dhanuravakra is the shape of *Basti* according to *Vagbhata* and it has downward opening.

Structure

Basti is thin membranous organ, covered with *Sira* and *Snayu* having single opening which is directed downwards.

Basti has been described as thin walled gourd shaped organ which is situated in the pelvic cavity. It is surrounded by various structures like umbilicus, back, loin, scrotum, anal canal, groin, penis, urethra, prostate, testis and rectum and is



considered as reservoir of urine. These details almost match with that of urinary bladder. On the basis of relations, structural and functional details, *Basti* can be accepted as synonym of urinary bladder.

MUTRA PRASEKA⁷ In classical *Ayurvedic texts* references related to *Mutra Praseka* is mentioned at some places. After compiling these descriptions, some facts regarding *Mutra Praseka* can be concluded. *Mehana*, *Mutramarga*, *Mutrapath*, *Medhra* these are the synonyms of *mutrapraseka*. During description of operative procedure of *Ashmari*, *Sushruta* has advocated to protect eight important structures, one of which is *Mutrapraseka*. Same reference is available in *Ashtang Sangraha*. *Dalhana* has mentioned that *Mutrapraseka* originates from lower end of *Basti* and releases the flow of urine. In male length of *Mutra Praseka* is approximately six *Angula*. In female length is two *Angula* and one *Angula* in *Kanya*. Considering the course, length and functional aspects it is clear that *Mutrapraseka* resembles urethra.

MUTRAVAHA STROTAS⁸

According to *Sushruta*, *Mutravaha Strotas* are two paired structures and their *Mula* is *Basti* and *Medhra*. *Charaka* considered *Basti* and *Vankshana* as their *Mula*.

Vagbhata has followed *Charaka* in this regard.

MUTRAVAHA NADI⁹

Mutravaha Nadis are situated in between *Amashaya*, *Pakwashaya* and *Basti*. These *Nadis* take origin from thousand of very minute openings, which are not visible. The functions of these *Nadis* are *Mutra Nishyandana* whether in state of awakening or sleep. They also drain the urine into *Basti* and keep it moist or filled with urine in the same manner as river drain their water into ocean.

MUTRAVAHA DHAMANI¹⁰ *Sushruta* described three types of *Dhamani* according to their course of directions. One among these is *Adhogami Dhamani*. *Adhogami Dhamani* (ten in numbers) are further subdivided into three parts, thus total number becomes 30. Functions of these *Dhamani* are to transport *Vata*, *Mutra*, *Purisha*, *Shukra* and *Artava* etc. These also participate in process of *Sara-Kitta Vibhajana*. Among these 30 *Adhogami Dhamanis*, two *Mutravaha Dhamani* go to *Basti*. Functions of these *dhamani* are *Dharana* and *Yapanaa* of *Mutra* and *Basti*. According to *Dalhana* these *Mutravaha Dhamanis* further subdivide into innumerable branches.

MUTRAVAHA SIRA¹¹

In *Charaka* and *Sushruta Samhita* description about *Mutravaha Sira* is not



available. *Ashtanga Hridaya* has first time described concept of *Mutravaha Sira*. *Mutravaha Sira*'s are regarded as minute channels carrying *Mutra* to *Basti*. These *Mutravahi Sira* open in the lateral side of *Basti* and fills the *Basti* with *Mutra* continuously by the process of *Nishyandana*.

PHYSIOLOGY OF URINARY SYSTEM IN AYURVEDA

*MUTROUTPATTI KRAMA IN AYURVEDA*¹²

There are evidences which prove that concept of formation of urine is known since *Vedic* period. First description about formation of urine is present in '*Atharvaveda*'. In *Atharvaveda* it is clearly mentioned that, *Mutranirman* takes place in *Antra* and it is transferred through *Gavini* and reaches *Basti*. According to *Ayurveda*, production of *Mutra* is ultimately related with '*Ahara*'. *Mutra* and *Purisha* both are *Mala* or *Kitta bhaga* (waste products) of *Ahara*.

Samana Vayu, *Pachaka Pitta*, *Purishdhara Kala* have role in *Mutranirman* and *Pakwashaya* is said to be seat of urine formation. According to *Sushruta*, *Pachaka Pitta* digests food and separates it in to *Rasa*, *Mutra* and *Purisha*. *Mutravahi Dhamani*'s are the structures carrying *Mutra* to *Basti*. *Dalhana*, while commenting on above, states that the

product which is the out-come of separation of *Sara* and *Kitta* gets its name as *Mutra* after reaching *Basti*.

In chapter *Ashmari Nidana*, *Sushruta* has clearly described his views regarding formation of urine that *Mutravaha Nadis* constantly drain urine into *Basti* and keep it moist. The *Mutravaha Nadis* drain urine into *Basti* in the same manner as all the river drain their water into ocean. *Mutravaha Nadis* carry on the function of *Mutra Nishyandana* continuously just as a new earthen pot when immersed upto its mouth in the water, will fill through its lateral pores in the wall by process of transudation. According to *Charaka*, food material after digestion converts into two forms viz. *Prasadakhya* and *Malakhaya*. Later the *Prasadkhya bhaga* i.e. essence part is converted into *Rasa* while *Malakhaya bhaga* is converted into *Mala* of body such as *Sweda* (sweat), *Mutra* (urine) *Purisha* (faeces) and other *Mala* of *Karna*, *Nasa* etc. This *Malakhya Kitta* maintains all these *Mala* in appropriate quantity through out life.

Vagbhata has briefly mentioned that *Basti* is placed with its mouth downwards and it is constantly filled by process of *Nishyandana* through numerous lateral openings of *Mutravaha Siras*. The above description clearly shows that none of the *Samhitakar* had considered *Vrikka* as



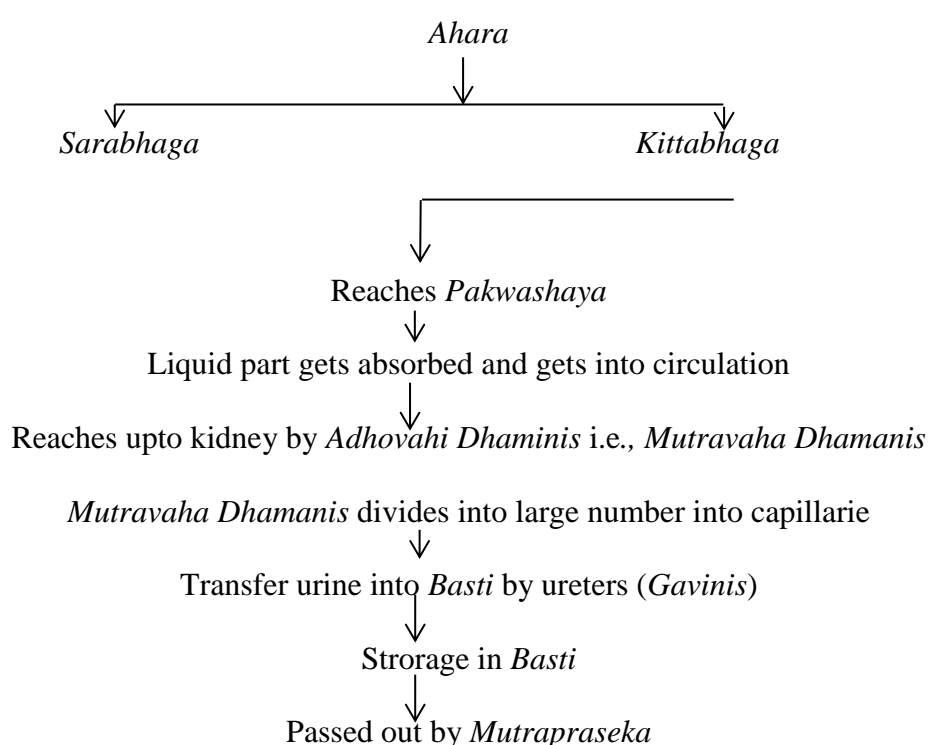
important organ in formation of urine. There is no doubt that our ancient scholars had concept of formation of urine but its relation with *Vrikka* was not known to them.

PHYSIOLOGY OF URINE FORMATION

Formation of urine in *Ayurveda* is related to '*Ahara*'. When food gets completely

digested liquid portion enters into *Pakwashaya*. Liquid portion absorbed from *Pakwashaya* is transported to *Basti* by help of two *Nadi*'s. Considering all the facts about anatomy and physiology of urine formation we can summaries process of urine formation as follows -

Fig.1 Urine formation



DISCUSSION

VRİKKA

The detail *Ayurvedic* anatomy of *Vrikka* is present in all *Ayurvedic* texts. The position, development and its functions are well described all over but no-one has mentioned role of *Vrikka* in urine formation or blood purification. The *Ayurvedic* scholars in 20th century described *Vrikka* which closely resembles

with kidney. But from references available in *Samhita* and their commentaries it cannot be interpreted that *Vrikka* is kidney. According to anatomy we can say it as kidney but based on physiological consideration we can't say *Vrikka* is kidney.

GAVINI



Gavinis are mentioned in *Atharvaveda* where they have been said to be two paired structures which originates from intestine and carries urine to *Basti*. During making of *Basti Yantra* there is some clue about two opening in bladder which should be ligated during procedure of *Basti* therapy. So, hypothetically *Gavinis* may be correlated with ureters.

BASTI

The detailed description about *Basti* is present in all *Ayurvedic* texts. There is no doubt that structure *Basti* and urinary bladder is one and the same.

There are number of points which support this view:

- (i) Shape - *Alabu aav* - oval shaped
- (ii) Position - The *Basti* is situated in pelvic cavity.
- (iii) Relation - *Basti* is surrounded by various structures. They are *Nabhi*, back, loin, scrotum, *Guda* (rectum), groin, penis, urethra; prostate (*Bastishira*) and testis. On the basis of anatomical position, shape, surrounding structures and its relations, it is clear that *Basti* is urinary bladder.

From the various references mentioned regarding anatomy and physiology of urine, some concepts can be accepted while some can be purely considered as hypothesis. The following ideas related to urine formation are valid till now:-

- *Basti* is reservoir of urine

- Division of food into stool & urine occurs at the level of alimentary canal
- Stool is propelled further through anal canal

Due to lack of advanced techniques, they could not find out what happens to liquid part absorbed through alimentary canal. They thought that there must be inter-linking system between alimentary canal and urinary bladder. They were unable to find any gross inter-linking anatomical organ so they concluded that there might be numerous, invisible structures which are carrying urine directly from alimentary canal to bladder and they named these structures as "*Mutravaha Nadis*". Fact has been proven on scientific grounds today that absorption occurs mainly at the level of alimentary canal and absorbed products are transported to bladder via kidney. The only reason why *Ayurvedic* scholars have not described kidney as important organ of urine formation can be attributed to lack of technical advancements. Some recent scholars have correlated *Mutravaha Srotas* as nephrons when used in plural form. This interpretation can't be accepted as no reference is present which suggests that knowledge about role of kidney was known to ancient *Ayurvedic* scholars.

MUTRAPRASEKA

There are lots of controversies about *Mutrapraseka*. It has various synonyms



some of which resembles penis. But considering its course, its length and functional aspects if can be correlated with urethra. Anatomy of urinary system is present in scattered form *Ayurvedic* texts. It may be that during such long period some matters have vanished so detail description about anatomical structures is not there. Whatever may be the reason but ancient *Ayurvedic* scholars did their job very well in that period.

CONCLUSION

- Ancient *Ayurvedic* scholars had knowledge about anatomy, physiology and pathological aspects of urinary system.
- But the physiological aspect of urine formation is entirely different from present knowledge.
- Pathological conditions mentioned under *Mutravaha Vikara* in *Ayurvedic* texts much simulates various diseases of conventional system of medicine.
- Rich literary source are available regarding the anatomy and physiology of urinary disorders in *Ayurvedic* texts. These have wide scope for further research in medical sciences.
- Even though repeated and intensive follow-up would be required to establish the efficacy of above approach, the results obtained in this study are encouraging enough to believe in the fundamentals of

Ayurveda and could provide some guidelines for future works, to certify the effectiveness of the age old heritage of *Ayurveda* in helping the needy individuals and to lead a more meaningful and healthy life through cost-effective and whole some solutions.

- This is just a preliminary attempt to interpret the hidden meanings in our texts. The references quoted are authentic and the commentary of these are direct form the text itself. It is just an effort to re-organize the scattered references in proper order with logical reasoning for better understanding of the subject to aid in the planning of management of disease.
- By considering and analysis above discussion the study is an attempt to compile the scattered urological anatomical and physiological terms in *ayurveda*, and correlate them with modern urology.



REFERENCES

1. Atharvaveda – Whitney's translation and notes, Vol. 7, 8, Harvard Oriental Series.
2. Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11 sharir sthana, Seven chapter Choukambha orientalia, Varanasi, 2001 Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, nidana sthana nine chapter, I edition, Choukambha
3. Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, , sharira sthana four chapter, I edition, Choukambha Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11 sharir sthana, third chapter Choukambha orientalia, Varanasi, 2001
4. Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, sharir stana, ninth chapter I edition, Choukambha Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11 viman sthana, fifth chapter Choukambha orientalia, Varanasi, 2001, Srikamtamurhy K.R., Vagbhata's Ashtanga Hridaya Samhita with English translation Vol-II, Sharir sthana fifth chapter, IV Edition, Krishnada academy, Varanasi, 2000.
5. Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11, Chikitsa, Siddhi sthana, Choukambha orientalia, Varanasi, 2001 Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, Chikitsa sthana thirty fifth chapter, I edition, Choukambha
6. Sushruta samhita with English commentary of Dallhana, Vol II, nidana stana, third chapter I edition, Choukambha Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11 sharir sthana, seventh chapter Choukambha orientalia, Varanasi, 2001, Srikamtamurhy K.R., Vagbhata's Ashtanga Hridaya Samhita with English translation Vol-II, Sharir sthana third chapter, IV Edition, Krishnada academy, Varanasi, 2000.
7. Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, chikitsa sthana seventh chapter, I edition, Choukambha
8. Sharma P.V., Sushruta samhita with English commentary of Dallhana, Vol II, sharir stana, ninth chapter I edition, Choukambha Sharma P.V., Charaka samhita of agnivesha, English translation, V1 edition, viol 11 viman sthana, fifth chapter Choukambha orientalia, Varanasi, 2001, Srikamtamurhy K.R., Vagbhata's Ashtanga Hridaya



Samhita with English translation Vol-II,
Sharir sthana ninth chapter, IV Edition,
Krishnada academy, Varanasi, 2000.

9. Sharma P.V., Sushruta samhita with
English commentary of Dallhana, Vol II,
nidan stana, third chapter I edition,

10. Sharma P.V., Sushruta samhita with
English commentary of Dallhana, Vol II,
sharir stana, ninth chapter I edition,

11. Srikamtamurhy K.R., Vagbhata's
Ashtanga Hridaya Samhita with English
translation Vol-II, nidan sthana ninth
chapter, IV Edition, Krishnada academy,
Varanasi, 2000.

12. Sharma P.V., Sushruta samhita with
English commentary of Dallhana, Vol II,
sutra sthan twenty one chapter ,sharir
stana, ninth chapter I edition,